

Aus der Oto-laryngologischen Klinik der Universität Basel
(Direktor: Prof. Dr. E. Lüscher)

Laryngeal-Hypopharyngeal Cancer; A Comparison of Two Decades

INAUGURAL-DISSERTATION

zur Erlangung der Doktorwürde der Medizinischen Fakultät
der Universität Basel

vorgelegt von

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New York, U. S. A.

1959

1960

Barrett Printing Company, Boston

*Von der medizinischen Fakultät Basel genehmigt
auf Antrag von Herrn Prof. Dr. E. Lüscher.*

Tag der Promotion: 1. Juni 1959.



I wish to thank P. D. Dr. Carl Rudolf Pfaltz, under whose direction this work was undertaken, for his invaluable and generous aid.

H. A.

To the investigator, the problem of cancer presents a unique challenge, one in which various lesions with certain common denominators are apparently produced by a multitude of factors — both known and unknown — which acting alone or in infinitely varied combination of kind and amount, are able at times to inflict upon that complex known as the individual, one — or rarely several — cancerous lesions. Similar lesions may apparently be produced by different factor combinations and different lesions by similar combinations. As with other cancer, researchers of the laryngeal-hypopharyngeal type have attempted to implicate various environmental factors.

Smoking: The idea that tobacco smoking may cause cancer of the larynx is not new. *Perez* expressed this view around the turn of the century and in 1911 *Segui* reported 75 patients with laryngeal cancer, whom he had seen in Havana, all of them heavy smokers. Among others, *Ducuing* and *Ducuing* (1936) and *Portmann* and *Moure* (1942) noted that a large percentage of larynx carcinoma patients had smoked excessively. *Roffo* (1937, see also *Bauer*, 1949), who observed that cancer of the respiratory and digestive passages is much more frequent in smokers than in non-smokers, was among the first to incriminate tobacco tar, to extract benzpyrene from it, and to produce cancer in animals with tobacco products. More recently the work linking bronchial carcinoma to the smoking habit has lent new impetus to this approach in the investigation of laryngeal cancer. In a controlled study of 241 male patients with cancer of the larynx, at the ORL Klinik in Erlangen, from 1948 to 1955. *Blümlein* (1955) found that 95.4% of the patients had for many years smoked 20 or more cigarettes (or equivalent) per day, as compared to only 9.3% of a control group. The following year, *Wynder*, *Bross*, and *Day* reported that in their study at three New York hospitals, they had found among 209 men with cancer of the larynx, a significantly greater number of smokers than in a matched control group, and that there was only one non-smoker with cancer, compared to 22 among the controls.

Drinking: In view of the consideration smoking has received in investigations of larynx carcinoma etiology, it is not at all surprising that its bedfellow: drinking has also been highly suspect. In 1932, *Freudenberg* held it for fairly certain that cancer mortality among occupational groups especially prone to heavy drinking was considerably higher than the average, and *Jötten* and *Replöh* calculated on the basis of English statistics that brewers between 55 and 65 had a cancer mortality 82.8% higher than the average. In 1936 and 1947, *Kennaway* and *Kennaway* (1957) found that increased laryngeal cancer morbidity was present in men concerned in the sale of alcoholic drinks but that their lung cancer morbidity was not exceptional. *Jackson* (1941), *Ahlbom* (1941), *Kirchner* and *Malkin* (1953), and others made clinical observations of high alcohol intake among larynx cancer patients.

Combined Noxae: *Wynder's* investigation shows a significantly larger number of drinkers with laryngeal cancer, especially extrinsic, than in a matched control group, and he goes on to speculate that tobacco may act as an "initiator" and alcohol as a "promoter" of laryngeal cancer. The multiple external cause idea (cocarcinogenesis or syncarcinogenesis) has

also been applied to smoking in combination with other factors. Thus *Blümlein* (1955, 1957) presents evidence that industrially contaminated city air, occupational noxae, and heat, while relatively innocuous alone, may act in conjunction with the smoking factor to cause cancer of the larynx.

Miscellaneous Factors: Many other factors have at various times been singled out as causes of laryngeal cancer or have been shown to be responsible in a limited number of cases. These include voice strain, malignant degeneration of pachyderma, radiation, chronic disease, etc.

Laryngeal Cancer in Male and Female: Typical laryngeal-hypopharyngeal cancer is primarily a disease of the male sex. A rather special position is occupied by post-cricoid cancer, an affliction commonly associated with the Plummer-Vinson syndrome (sideropenic dysphagia). This according to *Ahlbom* (1941) is "the cancer-predisposing factor of decisive significance" in Swedish women with hypopharyngeal cancer. Furthermore, in a series of Swedish patients, *Ahlbom* found cancer of the hypopharynx to be more common in women than in men, and in the former to originate in the post-cricoid region, a location which is rare in the latter. By reason of differing location and etiology, female post-cricoid carcinoma is considered by many to be an entity entirely separate from typical laryngeal-hypopharyngeal cancer.

Incidence: A prerequisite to the establishment of the responsibility of smoking for an increase in larynx carcinoma is, of course, proof that there has been an increase, as was demonstrated fairly conclusively in the case of bronchial cancer. This, however, has not been achieved with any clarity for cancer of the larynx. *Wynder* (1956) lists several reports of increase of the latter in the United States, perhaps the most impressive of which are a study by the National Cancer Institute, comparing 1937 with 1947 data in nine American cities, and reporting an increase of 42% in mortality and of 75% in incidence, and the fact that United States vital statistics show an increase in mortality of 47%, from 1930 to 1945. *Blümlein* reported an increase in larynx cancer morbidity at the Erlangen clinic from 13 cases between 1937 and 1939 to 114 cases from 1949 to 1951. On the other hand, English and Welsh mortality data (about which *Kennaway*, 1957, is somewhat skeptical) show no appreciable change during the aforementioned periods, and *Gsell* (1957) found no increase in larynx cancer mortality in Switzerland during the last ten years.

As a possible explanation of the data showing no increase, various authors have pointed out that they are mortality statistics, and since recovery, when laryngeal cancer is treated early and properly, occurs in a relatively high percentage (variously estimated between 75 and 95% for cancer of the vocal cords but considerably lower for all other locations), it is necessary to use not mortality but morbidity statistics, in order to get a true picture of the situation. While this argument is not without merit, it is not entirely satisfactory, for not only are not all cases of early discovered larynx carcinoma treated successfully, but a goodly number of cases is not discovered early. This is obvious in the aforementioned figures from the National Cancer Institute, which show a 75% increase in incidence and a

42% increase in mortality. Hence, one must conclude from the English and Welsh mortality data, that not only do they show no appreciable increase in deaths from laryngeal cancer, but that they indicate no large increase in morbidity as well.

Difficulties: Of the factors which tend to make the evaluation and comparison of data difficult in this field, the terminology problem is paramount. Some take the term: larynx carcinoma, to mean intrinsic laryngeal cancer (with or without tracheal cancer). Others add as well, extrinsic laryngeal cancer, which may or may not include the hypopharynx, which in turn has variously defined boundaries. It is to be hoped that international agreement will soon improve this situation (*Baclesse and Denoix, 1957*).

Akin to the problem of definition is that in the mortality statistics of many places, larynx carcinoma has only recently been made a separate entity. In Switzerland, for example, this came about in 1942, and until 1950 this heading included tracheal cancer as well (*Gsell, 1957*).

PURPOSE

In order to study the incidence of cancer of the larynx and hypopharynx treated at the ORL Klinik in Basel, and to evaluate the effects of smoking and drinking as causative agents of these afflictions, the present study was undertaken.

METHOD OF STUDY

Two ten-year periods — 1920 through 1929, and 1945 through 1954 — were chosen, and all cases of laryngeal and hypopharyngeal cancer which appear in the records of the ORL Klinik of the Basel Bürgerspital during these periods were studied. The times were so selected as to permit a differential evaluation of the effects of smoking as a causative agent in these types of cancer, inasmuch as during the first period the cigarette smoking rate was just beginning its tremendous climb and — allowing for a period of latency — could hardly be expected to play a significant etiological role, whereas in the second period, beginning some twenty-five years later, it could be expected to do so.

For the purposes of this study, the classification shown below, was used:

Intrinsic Laryngeal Carcinoma

- cancer of the interior of the larynx:
 - vocal cord
 - ventricle
 - false vocal cord
 - inferior epiglottis
 - anterior commissure
 - subglottis

Extrinsic Laryngeal Carcinoma

- cancer of the entrance of the larynx:
 - superior epiglottis
 - aryepiglottic fold
 - arytenoid area

Hypopharyngeal Carcinoma

- cancer of the lower third of the pharynx:
 - ventral hypopharyngeal surface (post-cricoid area)
 - sinus piriformis
 - dorsal hypopharyngeal surface
 - esophagus mouth

RESULTS

During the first ten-year period there were 79 men with an average age at onset of symptoms of 59 years, and during the second period there were 144 men with an average age of 61, treated for laryngeal or hypopharyngeal cancer at the ORL Klinik in Basel. (See Table 1.) During each of these periods there were four women treated for these ailments. (See Table 2.)

TABLE 1: CANCER OF THE LARYNX AND HYPOPHARYNX (MALE)

Point of origin		Number of cases		Average age at onset of symptoms	
		1920-29	1945-54	1920-29	1945-54
Intrinsic laryngeal cancer:	Vocal cord	19	38	58	60
	False cord		5		55
	Inferior epiglottis		1		(63)
	Anterior commissure	1*	1	(71)	(80)
	Subglottis		2		69
	Undetermined origin	3	9	59	62
Extrinsic laryngeal cancer:	Superior epiglottis	9	10	67	56
	Aryepiglottic fold	10	8	60	65
	Arytenoid area	4	2	60	78
	Undetermined origin	1	4	(60)	56
Hypopharyngeal cancer:	Sinus piriformis	25	56	59	63
	Dorsal wall	6	5	51	64
	Esophagus mouth		1		(66)
	Undetermined origin	1		(48)	
Undetermined extrinsic or hypopharyngeal cancer:			2		44
Group totals and age averages		79	144	59	61

*A case of carcinosarcoma reported by Prof. Oppikofer (1932)

() = not an average; a single case

TABLE 2: CANCER OF THE LARYNX AND HYPOPHARYNX (FEMALE)

Point of origin		Number of cases		Average age at onset of symptoms	
		1920-29	1945-54	1920-29	1945-54
Intrinsic laryngeal cancer:	Vocal cord	1		(64)	
	False cord		1		(52)
Hypopharyngeal cancer:	Post cricoid	1	3	(46)	51
	Sinus piriformis	1		(45)	
	Dorsal wall	1		(43)	
Group totals and age averages:		4	4	50	51
% of women in entire group:		1920-29	4.8	1945-54	2.7
Male-female ratio:			20:1		36:1

Smoking and Drinking Data: The records of the cases in the 1920-29 period were found to be fairly complete in regard to information about the patients' smoking and drinking habits. Of a total of 79 male patients with laryngeal or hypopharyngeal cancer, there was information regarding smoking in 65 cases and about drinking habits in 57. In most instances this data was explicit as to quantity and type, and in only a minority were there more general comments such as "heavy smoker" or "moderate drinker". Those instances where there was no information, occurred, for the most, with females, private or obviously difficult patients, and apparently represent omissions and not necessarily a negative response. Furthermore, there are negative remarks recorded.

A similar compilation could not be made for the 1945-54 period.

It is a notoriously difficult task to obtain accurate information about a patient's smoking and drinking habits, and at best such information should be taken *cum grano salis*. In order to reduce the margin of error and to facilitate the utilization of general remarks, the categories used here in the quantitative classification of smoking and drinking are broad.

Control Group, etc.: For the purposes of comparison and evaluation, similar studies were carried out with the records of a control group of 56 male patients over 50 years of age (average: 58 years), hospitalized on the wards of the ORL Klinik in Basle during the 1920-29 period, for non-cancerous ailments, and with those of a group of 69 esophagus cancer patients (average age: 57) treated during this period.

Classification of Smoking: Smokers were quantitatively classified as follows:

Non-smoker	: one who smokes no cigarettes per day
Light smoker	: one who smokes 1-9 cigarettes per day
Moderate smoker	: one who smokes 10-19 cigarettes per day
Heavy smoker	: one who smokes 20-34 cigarettes per day
Very heavy smoker	: one who smokes 35 or more cigarettes per day

Other types of smoking were converted into cigarette equivalents using the following values:

- 1 pipe = $2\frac{1}{2}$ cigarettes
- 1 cigar = 5 cigarettes
- 1 Stumpfen (short cigar) = 4 cigarettes

The results are shown in Table 3, alongside equivalent values for the control group and for the esophagus cancer patients.

**TABLE 3: QUANTITATIVE ANALYSIS OF SMOKING HABITS
MALE PATIENTS (1920-29)**

Cancer of: No. patients information available on:	A. Int. larynx		B. Ext. larynx		C. Hypo- pharynx		D. Tot. Lar. & Hypophar. (A+B+C)		E. Esoph- agus		F. Control group	
	17		21		27		65		64		54	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Non-smokers:	1	6	0	0	0	0	1	2	0	0	8	15
Light smokers; 1-9 units:	4	23	3	14	2	7	9	14	16	25	17	31
Moderate smokers; 10-19 units:	1	6	6	29	8	30	15	23	12	19	13	24
Heavy smokers; 20-34 units:	9	53	9	43	11	41	29	44	27	42	13	24
Very heavy smokers; 35+ units:	2	12	3	14	6	22	11	17	9	14	3	6

A breakdown into kind of smoking is shown in Table 4.

**TABLE 4: QUALITATIVE ANALYSIS OF SMOKING HABITS
ACCORDING TO MAIN SMOKING FORM; MALES (1920-29)**

Cancer of: No. patients information available on:	A. Int. larynx		B. Ext. larynx		C. Hypo- pharynx		D. Tot. Lar. & Hypophar. (A+B+C)		E. Esoph- agus		F. Control group	
	12		8		14		34		42		21	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cigarettes:	5	42	0	0	3	21	8	24	3	7	4	19
Cigars and Stumpen:	5	42	3	38	7	50	15	44	13	31	12	57
Pipes:	2	16	4	50	4	29	10	29	20	48	5	24
Chewing*:	0	0	1	12	0	0	1	3	6	14	0	0

*In most mixed chewing and smoking cases, it was not possible to judge which form of tobacco usage was predominant; therefore chewing is indicated wherever found, whether the major form or not.

Classification of Drinking: A quantitative classification of drinking habits was undertaken, using the following criteria:

- Non-drinker : one who does not drink
- Light drinker : one who drinks up to 0.5 liters of wine (or its beer or hard cider equivalent) per day, and seldom shots.
- Moderate drinker : one who drinks up to 0.5 liters of wine (or equivalent) and up to 5 shots per day, or up to 1 liter of wine (or equivalent) and seldom shots.
- Heavy drinker : one who drinks 1 liter of wine (or equivalent) and 5 shots per day, or more.

The following conversion ratios were used:

1 liter of beer = 0.5 liters of wine

1 liter of hard cider = 0.25 liters of wine

Table 5 indicates the results of this study.

**TABLE 5: QUANTITATIVE ANALYSIS OF DRINKING HABITS;
MALE PATIENTS (1920-29)**

Cancer of: No. patients information available on:	A. Int. larynx		B. Ext. larynx		C. Hypo- pharynx		D. Tot. Lar. & Hypophar. (A+B+C)		E. Esoph- agus		F. Control group	
	15		20		22		57		59		52	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Non-drinkers:	1	7	0	0	0	0	1	2	2	3	0	0
Light drinkers:	5	33	4	20	6	27	15	26	17	29	25	49
Moderate drinkers:	3	20	10	50	6	27	19	33	20	34	17	33
Heavy drinkers:	6	40	6	30	10	46	22	39	20	34	10	19

Table 6 shows the frequency of the various types of drinking for each group of patients.

**TABLE 6: QUALITATIVE ANALYSIS OF DRINKING HABITS
ACCORDING TO MAIN DRINKING FORM; MALES (1920-29)**

Cancer of: No. patients information available on:	A. Int. larynx		B. Ext. larynx		C. Hypo- pharynx		D. Tot. Lar. & Hypophar. (A+B+C)		E. Esoph- agus		F. Control group	
	9		14		16		39		42		31	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Hard cider:	1	11	3	22	3	19	7	18	2	5	1	3
Beer:	3	33	2	14	3	19	8	20	10	24	2	6
Wine:	5	56	9	64	9	56	23	59	28	66	27	88
Brandy and Whiskey:	0	0	0	0	1	6	1	3	2	5	1	3

DISCUSSION

Incidence: As discussed above, the incidence question is a particularly perplexing one, with different studies in this field having produced divergent results. The results of this study indicate that there was an increase in the absolute number of cases of total larynx-hypopharynx cancer from 79 male patients in the 1920-29 period to 144 for the period: 1945-54. However, this increase was not evenly divided among the component subgroups. The intrinsic laryngeal subgroup showed the greatest increase (143%), while the hypopharyngeal category increased 97%. On the other hand, the number of extrinsic cancer cases was the same in both periods; there was no increase in absolute number here. (See Table 7.)

**TABLE 7: INCREASE IN MALE LARYNGEAL AND HYPOPHARYNGEAL CANCER,
IN ABSOLUTE NUMBERS, FROM 1920-29 TO 1945-54**

	Tot. Lar. & Hypopharynx	Intrinsic larynx	Extrinsic larynx	Hypopharynx
1920-29; cases:	79	23	24	32
1945-54; cases:	144	56	24*	63*
% Increase:	77	143	0	97

*The two cases of carcinoma of undetermined origin in either the extrinsic larynx or hypopharynx were divided, one apiece, between the extrinsic larynx and hypopharynx subgroups.

In order to properly evaluate these results, various other factors must be considered. (Table 8 presents a compilation of such factors.) In any study of incidence, one must consider population changes. In Kanton Basel-Stadt this amounted to an increase of 32 percent between the two periods. (Not all of our patients lived in Basle, but these figures are considered to be representative.) Typical larynx carcinoma does not affect the entire population in a random distribution, however; it is primarily a disease of older men; only two patients in each of the male groups were under forty. A comparison of the number of men living in Basle, who were forty years or older during each of the periods, shows an increase of 57 per cent in the later period. This is in keeping with the trend toward longer life and a general increase in population. It means, however, that there were about 57 per cent more candidates for cancer in the 1945-54 period. Evidence of this phenomenon is found in the increase in average age from 59 in the earlier male cancer group to 61 in the later. (See Table 1.)

More pronounced than the population changes were the changes in the facilities of the ORL Klinik and Poliklinik in Basle; out-patient service was increased by 41 per cent and in-patient service 156 per cent. As time passed, diagnostic techniques were improved and more liberally employed, as evidenced by the 308 per cent increase in biopsies. Not directly pertinent to our study but important in the consideration of mortality statistics is the recorded 86 per cent increase in autopsies.

TABLE 8: VARIATION IN FACTORS PERTINENT TO THE INCIDENCE QUESTION

	Earlier period	Later period	% of increase	
Population of Kanton Basel-Stadt ¹ :	1920 : 140,708 1930 : 155,030	1950 : 196,498	approximately	32%
Number of men over 40; Kanton Basel-Stadt ¹ :	1920 : 20,372 1930 : 23,509	1950 : 38,201	approximately	57%
Total number of Pts.; ORL-Poliklinik ² :	1920-29: 37,194	1945-54: 52,360		41%
Tot. In-patient illness; ORL-Klinik, Basel ² :	1920-29: 7,011	1945-54: 17,922		156%
Average number biopsies/year; Path. Anstalt ³ :	1922-29: 2 604	1945-54: 10.633		308%
Average number autopsies/year; Path. Anstalt ³ :	1922-29: 771	1945-54: 1,435		86%

¹ Statistisches Jahrbuch des Kantons Basel-Stadt, 1956

² Jahresbericht, Burgerspital Basel, 1920-29 and 1945-54

³ courtesy of Prof. A. Werthemann, Pathologische Anstalt, Basel

After careful consideration of the aforementioned factors, it becomes apparent that there is no appreciable real increase in total laryngeal-hypopharyngeal carcinoma, from the 1920-29 period to the 1945-54 period, shown in our study. On the contrary, there actually was a decrease in extrinsic laryngeal cancer while both the intrinsic laryngeal and hypopharyngeal types showed no significant variation. These results are in keeping with those of *Gsell* (1957) who found no increase in laryngeal cancer mortality, in Switzerland, from 1942 to 1955. (His compilation, which covers a relatively short period, shows a constancy in absolute number of deaths, as well.)

A Hypothetical Case: Just how misleading mortality statistics can be when one is dealing with carcinoma of the larynx, is shown in the following hypothetical example. The term: laryngeal cancer, will be used to include both extrinsic and intrinsic types, but not hypopharyngeal cancer (as is presently done in Swiss mortality statistics). It will be assumed that our findings for the 1920-29 and 1945-54 periods represent the figures for Basel-Stadt for the respective periods. It will be further assumed that these figures represent all of the cases which have come to light, and that intrinsic cancer, when treated, is cured 80 per cent of the time and extrinsic only 15 per cent of the time. (*Lüscher*, 1948 and 1956 listed 70-90% for the former and 10-20% for the latter.)

This being so, then the following situation would have resulted:

1920-29:

Intrinsic cancer cases:	23, of these	5 dead
Extrinsic cancer cases:	24, of these	20 dead
Total:	47	25

1945-54:

Intrinsic cancer cases:	56, of these	11 dead
Extrinsic cancer cases:	24, of these	20 dead
Total:	80	31

The population of Basel-Stadt increased approximately 32% (from 148,000 to 196,000) between these periods; therefore the approximate mortality rates, per 10,000 inhabitants, per annum, would be for 1920-29 : 0.17, and for 1945-54 : 0.16. The concomitant morbidity figures of 0.32 and 0.41, respectively, would show somewhat more clearly that there is a difference in the two periods.

What is brought out by the above example and the difference in lethality between intrinsic and extrinsic laryngeal cancer, is that "larynx cancer" of the male is not an entity, and cannot properly be studied as such, without the true picture being obscured. It must be divided and the subgroups studied separately.

A Comparison with Zuppinger: An interesting comparison can be made with the incidence figures from the earlier decade of the present study in Basle, Switzerland, and those of Zuppinger's (1931) study of pharyngeal and laryngeal malignancies, which occurred in Zurich, Switzerland, from 1919 to 1928. His finding of 22 intrinsic laryngeal carcinoma cases (including 3 females) and of 25 extrinsic cases* (including 2 women) corresponds to an amazing degree, in absolute numbers, to our findings for the period: 1920 to 1929. On the other hand, his 76 sinus piriformis cases among males, is about three times our equivalent figure. This is explainable, however, in that Zuppinger collected his material from the surgical clinic, röntgenological institute and other sources as well as from the ORL Klinik in Zurich, whereas our material comes solely from the Basel ORL-Klinik. Accordingly, those cases referred directly to surgery or röntgenology are not listed. This of course would be more likely to have happened with a patient presenting with dysphagia than with hoarseness. As the same factor operated in both the earlier and later period, it should not interfere with the significance of our results.

Laryngeal Cancer in Women: Another comparison with Zuppinger's work shows that among females, in addition to the 3 intrinsic and 2 extrinsic laryngeal carcinomas mentioned above, he found only 5 cases

*The term "extrinsic" is used here for cancer of the laryngeal entrance, only, and not as Zuppinger did to include the hypopharynx as well. Consequently, Zuppinger's figures have been placed in the appropriate categories of the present terminology.

(including 4 post-cricoid) of hypopharyngeal cancer. This also ties-in well with there having been only 4 females in our earlier group, and conforms to the doctrine that cancer of the laryngeal-hypopharyngeal region, in women, tends to be largely of the post-cricoid type, which according to *Jacobsson's* (1951) observation is common in certain northern European countries but extremely rare in France and Switzerland.

The reasons for the pronounced differences in laryngeal-hypopharyngeal carcinoma in the male and female remain obscure. Whether the obvious sexual differences—hormonal and otherwise—are the deciding factors (*Hesse, 1951*) or whether differing environmental exposure is more important remains to be seen.

Smoking Data: The value of our smoking study is limited by the following factors:

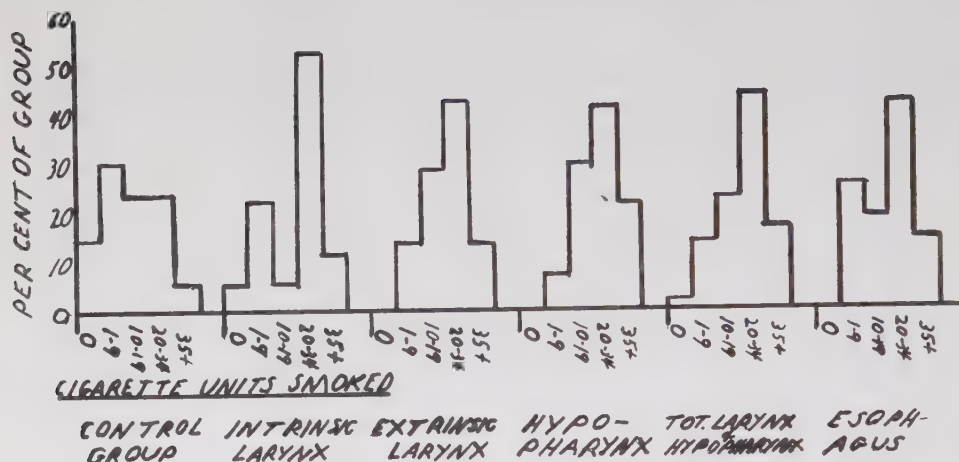
1. the small number of cases in some of the subgroups,
2. the verbatim acceptance of general remarks such as "light smoker" as found in a minority of the case histories used in this study. (This error was at least partially eliminated by the use of broad categories.),
3. the undoubted existence of inaccuracies in some of the patients' statements,
4. the information having been gathered not by one individual but by different physicians.

In brief, one must be cautious in the use of this data.

One thing is shown, however; there was more smoking in all of the cancer categories: intrinsic larynx, extrinsic larynx, hypopharynx, and esophagus, than in the control group (Table 3). This manifests itself as a shift to the right in Figure 1, below.

Roffo (1937), *Sadowsky*, et al. (1953), *Wynder*, et al. (1956) and others, all found that a relationship between smoking and laryngeal cancer exists. *Gsell* (1957), using tobacco production and trade figures, found that the consumption of cigarettes in Switzerland, for 1955, was approximately 14 times what it was in the mid-twenties (The comparatively low cigarette smoking rate of this era is reflected in Table 4.), whereas the consumption of cigars was approximately the same and pipe smoking had fallen off only slightly. Despite the increase in population and in the number of women-smokers, this probably means that there are not only more smokers but a greater number of heavy smokers in the male population of Switzerland, today, than there were in the twenties, and of course cigarette smoking has been largely responsible for the increase.

FIGURE 1: QUANTITATIVE ANALYSIS OF SMOKING HABITS:
MALE PATIENTS (1920-29)



Why then, if smoking is a cause of laryngeal cancer, hasn't the increase in smoking been followed by a definite increase in laryngeal cancer, here? The hypothesis (*Wynder, 1956*) that cigarette smoking may be most closely related to intrinsic laryngeal, and cigar and pipe smoking to extrinsic and hypopharyngeal cancer might explain the decrease in the percentage of extrinsic cases and the increase in the share of the total laryngeal-hypopharyngeal cancer group occupied by intrinsic cancer in the later period, but it does not account for the lack of a pronounced increase in laryngeal cancer of the intrinsic type.

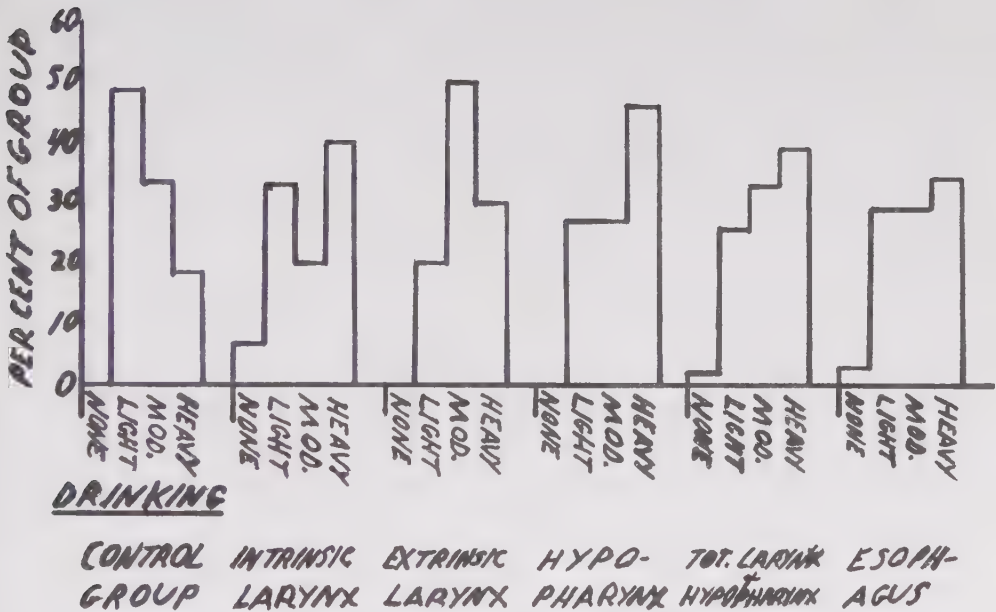
One might theorize that a relatively high incidence of laryngeal cancer has existed for years in Switzerland, perhaps at a near-saturation level, [*Gsell, 1957*, found a mortality rate of approximately 5 per 100,000, per annum, from 1942 to 1955, and on the basis of the present study, one might surmise that it has been quite the same, for a long time. In any event, the aforementioned Swiss mortality rate is higher than the present estimated morbidity rate for this affliction, of 3 or 4 per 100,000 (*Wynder, 1956*) in the United States.] and that it was due, largely, to cigar, Stumpfen, and pipe smoking. The shift to cigarettes, which may have an altogether different quantitative carcinogenic worth; could therefore, despite an over-all increase in smoking, have changed the picture to reflect, only, the stronger association between cigarettes and intrinsic laryngeal cancer. The difference between the behavior of the extrinsic laryngeal and hypopharyngeal cancer rates found in this paper, might then be explained by a closer association between hypopharyngeal cancer and swallowed noxae

(e.g., tobacco juice and alcohol) than exists for extrinsic laryngeal cancer. This theory gains support from Davis' (1959) finding, at this clinic, of a correlation between cigar, Stumpen, and pipe smoking, and all upper respiratory malignancies, which is especially strong for the hypopharynx.

Quite possibly, smoking is a cause of laryngeal cancer; this does not rule out the existence of other factors, the variation of which would more easily explain the differing reports in regard to the question of increasing incidence.

Drinking Data: Our drinking figures suffer from the same shortcomings mentioned in connection with the smoking data. A somewhat greater alcohol consumption was found for all of the cancer categories than for the control group (Table 5). This is graphically illustrated in Figure 2.

**FIGURE 2: QUANTITATIVE ANALYSIS OF DRINKING HABITS;
MALE PATIENTS (1920-29)**



SUMMARY AND CONCLUSIONS

A comparative study of the records of all the cases of laryngeal and hypopharyngeal cancer on file at the ORL Klinik of the University of Basel, for the two decades: 1920-29 and 1945-54, was undertaken.

1a. For men, there was found to have been an increase of 143% in the number of intrinsic laryngeal cancer cases in the later period. This,

however, is believed to represent, at the most, only a small increase when one considers the concomitant increase of 57% in the male population forty years or older, of Basel-Stadt; the 41% increase in out-patient census at the ORL Klinik; the 156% increase in in-patient illness, and the improved and more liberally employed diagnostic procedures evidenced by a 308% increase in the number of biopsies carried out by the Institute of Pathology, Basel.

Hypopharyngeal cancer (up 97% in number of cases) is not considered to show any significant variation from the earlier period; whereas extrinsic laryngeal cancer by showing no increase in number of cases, has actually decreased. (Total laryngeal-hypopharyngeal cancer increased 77% in number of cases.)

b. Women accounted for 4.8% of the cases in the earlier period and 2.7% of the later. There were four women in each period.

2. A study of smoking in the 1920-29 period showed that patients with all the types of cancer considered: intrinsic laryngeal, extrinsic laryngeal, and hypopharyngeal, as well as a group of esophagus cancer patients, smoked more heavily (on an average) than did a control group.

3. The laryngeal-hypopharyngeal and esophagus cancer patients were found, in a study of the 1920-29 period, to have drunk more heavily than the members of a control group.

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